Clouds in a Glass of Beer

1) Why is there a hiss when you open the cap?
2) Why does a cloud form when you open the cap?
3) When you pour the beer into a glass, why do the bubbles form where they do?
4) As the bubbles rise, they get bigger. Why?
5) As the bubbles rise, they get farther apart. Why?
6) The "head" that forms on the beer is white. (Well, sort of white.) The beer is brown. How do you explain the difference?
7) The glass "sweats". Where does this water come from?
8) As the glass "sweats", does this tend to warm up the glass or cool it down?
9) How does the size and the structure of the bubbles change as time goes on?

Clouds in a Glass of Beer

1) Why is there a hiss when you open the cap?

   The bottle is pressurized. When you open the cap, the release of pressure leads to a hiss.

2) Why does a cloud form when you open the cap?

   The release of pressure leads to a rapid cooling of the air inside the bottle. The air is saturated with water vapor, and it has organic molecules floating around as well, which can serve as nucleation sites. Net result: Just like the cloud in a bottle. But tastier.

3) When you pour the beer into a glass, why do the bubbles form where they do?

   The bottle is etched. The rough edges make nucleation sites suitable for bubbles to form.

4) As the bubbles rise, they get bigger. Why?

   They grow! Once you've made a bubble, you've done the hard part, energetically speaking. More molecules of carbon dioxide can now easily add to the bubble, making it grow.

5) As the bubbles rise, they get farther apart. Why?

   There is an upward force on the bubbles, so they accelerate. They move faster as they rise, so spread out.

6) The "head" that forms on the beer is white. (Well, sort of white.) The beer is brown. How do you explain the difference?

   Scattering! It's just like the "Why are Clouds White?" experiment. But tastier.

7) The glass "sweats". Where does this water come from?

   The atmosphere. The cold glass is colder than the dew point for the air in the room. Water vapor thus condenses on the surface of the glass.

8) As the glass "sweats", does this tend to warm up the glass or cool it down?

   Water vapor turning to liquid water... Warms it up!

9) How does the size and the structure of the bubbles in the foam change as time goes on?

   Smaller bubbles merge to make larger bubbles, which subsequently pop. The bubbles "coalesce" just as falling raindrops do, leading to more (and bigger) drops.